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The Utilization of Osteoarticular Transfer System in the Treatment of Distal Femur Osteoid Osteoma: A Case Report

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Abstract

Introduction
Tumor excision of the subchondral bone of the distal femur epiphysis is technically challenging particularly in skeletally immature patients due to the open physis above and articular surface below. Preservation of the physis, maintenance of structural support to, and integrity of, the cartilage, and conservation of joint surface below. Preservation of the physis, maintenance of structural integrity to preserve physiologic joint kinematics.

Materials and Methods
We present a case of a 16-year-old male athlete with a distal femur epiphysiolysis bone lesion. He underwent trans-articular en bloc excision and autograft reconstruction using Osteoarticular Transfer System (OATS) technique.

Results
Final pathology revealed complete excision of an osteoid osteoma. The patient had regained full strength and range of motion at 3 months postoperatively, and at 21 months postoperatively was free of disease and back to full level of athletic participation.

Conclusions
We describe a technique for excision of subchondral bone lesion in the distal femur in skeletally immature patients that mitigates risk of complications associated with surgical injury, incomplete tumor resection, and iatrogenic injury to the overlying cartilage.

Background
Osteoid osteomas are painful, benign, osteoblastic tumors representing about 15% of all primary bone tumors.\(^7\)\(^8\)\(^9\) While rare, these tumors can arise within the epiphysis where they can be difficult to excise due to the risk of arthritic cartilage damage and physeal injury.\(^7\)\(^8\)\(^9\) Initial management is conservative with nonsteroidal anti-inflammatory drugs which control symptoms and can hasten spontaneous regression.\(^7\)\(^8\)\(^9\) If medical management fails or is unsatisfactory, most osteoid osteomas are treated with minimally invasive techniques such as CT-guided percutaneous radiofrequency ablation, MR-guided high-intensity focused ultrasound or surgical resection with curettage.\(^7\)\(^8\)\(^9\) Challenges arise when these lesions develop in subchondral, subperiosteal, or peripheral locations, where percutaneous treatment modalities may cause injury to cartilage, skin, or nerve tissue in close proximity to the bone lesion.\(^7\)\(^8\)\(^9\) Very few cases of an osteoid osteoma in the distal femoral epiphysis have been described in literature.\(^7\)\(^8\)\(^9\)

This anatomic location is particularly tenuous in a skeletally immature patient, due to proximity of the physis above and cartilage below, and the importance of maintaining subchondral bone integrity to preserve physiologic joint kinematics.\(^7\)\(^8\)\(^9\) The OATS procedure, first described in 1991, demonstrates improved clinical outcomes as a cartilage resurfacing technique. Its use is thoroughly described in the orthopaedic sports medicine literature, but its utility as a reconstructive technique after distal femur tumor resection has not been reported.

Case Summary

We present a case of a 16-year-old male athlete with a distal femur epiphysiolysis bone lesion. Given the failure of nonoperative management as well as the surgical constraints of this epiphysiolysis location, the surgeon recommended trans-articular en bloc excision of the tumor and autograft reconstruction utilizing Osteoarticular Transfer System (OATS) technique. This technique should be considered as an excel lent option for tumor excision with autograft reconstruction of an epiphyseal osteoid osteoma.

Figure 5A and 5B – Histopathologic examination of resected specimen. (30x power) (Fig 5A left side demonstrates the lesion site) 3.5x (Fig 5B right side demonstrates the lesion site) 2.5x H&E stain demonstrates the osteoid osteoma with rich osteoclasts, with rich vasculature.

Figure 3A and 3B – Intraoperative fluorescein demonstrating round sclerotic lesion with minimal uptake in lateral aspect of the subchondral bone.

Figure 4 – Intraoperative photograph of distal femur after OATS transfer.

Figure 6A-IC – Anteroposterior (Fig 6A), lateral (Fig 6B), and oblique (Fig 6C) radiographs illustrating the healed OATS reconstruction, 21 months postoperatively.

Discussion

Our study offers 21 months of follow-up of a pediatric patient who underwent transarticular en bloc excision with OATS reconstruction for a distal femur osteoid osteoma offers high healing potential with minimal donor-site morbidity and a superior method of cartilage repairing.\(^7\)\(^8\)\(^9\) This technique may provide precise and thorough excision while minimizing risk of physiologic disturbance in skeletally immature patients, decreasing risk of limb length inequality and malalignment.\(^7\)\(^8\)\(^9\)

References